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Raw Materials

433 Considering the present structure of Syrian industry, its supply of raw materials is generally speaking not unsatisfactory. In the preceding section we have referred to the import needs, if any, of Syria's principal industries. Most local and imported raw materials are generally available at competitive prices. The principal exception is sugar, the high price of which presents a serious drawback to the fruit canning, jam and candy industries. The prohibition of imports of cotton seed for industrial use hampers the ability of vegetable oil manufacturers to enter the export market at competitive prices. Some branches of the textile industry dependent on imported cotton yarn or cloth, subject to high customs duties, are in a similarly unfortunate position.

On the other hand certain laws or regulations in effect give some Syrian industries a right of first refusal with regard to locally produced raw materials; export of both ginned and non-ginned cotton, cotton seed, raw wool and raw hides, is subject to licensing, while export of timber and raw metals is prohibited. The efficacy and desirability of such measures may be questioned (see Section IV), but they are elements of the prevailing industrial climate.

The transportation of local raw materials to the industrial centers, where they are processed, is not unduly burdensome, thanks to the favorable location of Syrian industries in or near the producing areas. Moreover, the distances between these centers and the seaports are not too great. Nevertheless, transportation in Syria is relatively costly and an improvement in the transport sector would not only facilitate exports of surplus raw materials but would also benefit the processing industries and their competitive position.

Water and Power

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371 The main industrial centers are, generally speaking, well provisioned with water. Damascus has the best water supply among Syrian cities, thanks to the springs of Figeh. Aleppo's water supply, which was so inadequate that some factories had to select sites outside of the town where they could drill their own wells, has now been greatly improved by a link with the Euphrates River. Homs and Hama have more than sufficient water

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resources in Homs Lake. The water rates charged by the municipalities are by no means excessive.

With regard to electricity for light and power the conditions are, however, much less favorable. The capacity of the municipal power plants in the four main industrial cities is far from sufficient to meet total consumption needs. Most of the larger factories have had to install their own power plants, which imposes an additional capital burden on them.[3] Factories which have no power plant of their own often suffer considerable losses resulting from breaks in the power and light supply. Electricity rates of public utilities, although higher in Syria than, for instance, in Lebanon, Turkey and Egypt, compare not unfavorably with those in the main Western industrial centers.

Equipment

The mechanical equipment of the major industries is in general good. Obsolete or inefficient machinery is continuously being replaced by new plant. Nevertheless, there are still many old factories and workshops where equipment is primitive and modernization is much needed.

Some industries, however, seem as a whole to be overequipped in relation to the available raw material supply or the market outlets for their products. A striking example is the installed capacity in the cotton ginning industry, which could handle between two and three times the present cotton crop. This is no doubt due in part to an overestimation at the time of the cotton boom. The government has accordingly prohibited the importation of cotton gins. In the case of the vegetable oil industry the installed capacity might be more fully utilized if cotton seed were freely importable and oil manufacturers could enter the export market for vegetable oils at competitive prices. As a complement to the protection of local cotton seed, the government has also placed an embargo on the importation of vegetable oils. A third instance of overequipment is in the glass industry: the Damascus factory was designed and installed on the basis of the rather ambitious notion that it should serve most of the needs of the Middle East. Some of its machinery, as for instance that for the manufacture of electric bulbs, has never been in operation. Although most of the items it produces may not be imported into Syria and although recently

[3] See Annex G, p. 413.

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ANNEX G *NOTES ON ELECTRIC POWER*

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Energy Resources

Coal, oil and lignite resources are apparently lacking; and the calorific value of the small peat deposits is low and unutilizable. The potentialities of hydroelectric power are limited by the low volume and gradient of the rivers, the almost total absence of falls or rapids and the wide variations in seasonal flow. Only the Youssef Pasha site, on the Euphrates, has considerable possibilities for power generation. It is estimated that at this location there could be developed a firm power of 45,000 KW and a maximum of 90,000 KW. It is doubtful whether power potential on all other rivers together exceeds 60,000 KW, so that Syria's total estimated hydroelectric potential is approximately 150,000 KW—about the same as that of the Lebanese project of Litani alone.

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1 PUBLIC UTILITIES

Installed Capacity

In 1953 the installed power capacity was as shown in Table 1.

TABLE 1 Installed Power Capacity, 1953

	Installed power		Peak load
	KW	KVA	KW
Damascus	13,000	16,500	13,160
Aleppo	10,400	15,050	10,040
Homs-Hama	2,650	3,510	2,650
Latakia	800	1,000	800
Deir ez Zor	840	915	840
Small towns and villages	6,660	7,801	6,544
Total	34,350	44,776	34,034

These data indicate that the average load factor was 40%.[1]

[1] The load factor is the ratio of the average load in KW supplied during a designated period to the peak or maximum load occurring in that period.

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above, additional power to the extent of approximately 14.2 and one million KWH respectively will probably be needed. The other industries specified are not expected to need substantial additional amounts of power. 377

On these assumptions the output of the private power plants would need to increase from about 43 million KWH to some 60 million KWH by 1960, but it is more than likely that at least part of the necessary increase will in fact be drawn from the public utilities network.

III THE MISSION'S PROGRAM

The period 1949-53 showed a mean annual increase of 14.2% in the generation of public power. The actual percentage of increase over the preceding years was as follows: 371 377

1950	1951	1952	1953
19.4	7.8	14	16.2

The figure for 1951 reflects the effect on Syrian industry of the cotton crisis. Taking all factors into account, it would not be unreasonable to expect a continued average yearly increase of 14% between 1953 and 1960. On this basis about 300 million KWH would be generated in 1960 and since the load factor is not expected to improve, the peak load would probably be about 85,000 KW, requiring a minimum installed capacity of some 106,000 KVA. This means that some 60,000 KVA must be added to the approximately 45,000 KVA (34,350 KW) presently available plus a reserve of 20-25%.

It is believed that in 1945 there was a total installed capacity of about 13,000 KVA, able to generate 10,400 KW. During the eight succeeding years the increase was about 31,776 KVA, or 23,950 KW—an increase of some 245% or an average rate of 17% per year. Although this has not been sufficient to keep pace with rising consumption demands, it would lead to a total installation of 130,000 KVA if continued until 1960. This would give a margin of 23% over the anticipated minimum peak load for that year, which should be quite satisfactory for a country where there is practically no interconnecting network and where a large number of small generators is the rule (e.g., 18 in Damascus for an installed power of 16,500 KVA, and seven in Aleppo for 15,000 KVA). On the principle that

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371 each network should have in reserve a capacity equal to that of the largest
377 generator, Syria's present reserve requirements would total about 10,000 KVA, equal to 22% of total installed power. The reserve requirements have not been met in the past, although the situation will be greatly improved by the addition of the 14,610 KVA scheduled to start operating during 1954.

Damascus

In the Damascus area the annual increase in consumption has averaged only 10.8% over the last five years. It seems, therefore, that the peak load is unlikely to exceed 30,000 KW by 1960. This would call for a capacity of about 37,000 KVA, compared with the 16,500 KVA installed at present. The new Hameh steam plant, due to start operating at the end of 1954, would raise present capacity to 29,000 KVA and when the Souk Wadi Barada hydroelectric plant is completed in 1956 total installed power will be 37,000 KVA. In view of the fact that the Damascus diesel plant is 22 years old, the mission recommends that additional capacity of about 12,500 KVA (10,000 KW) be added to provide an adequate reserve.

There are three possible ways to provide the additional capacity. One is to install an extra set of 12,500 KVA in the new Hameh steam plant. Another is to construct new hydroelectric plants; and a third is presented by the possibility that a beginning will shortly be made on the Yarmuk power project by the Jordan Government, in which case, under the terms of an agreement with Jordan, Syria would receive 5,000 KW annually in return for an investment of 5% of the cost of the project. But to supply the balance of 5,000 KW to meet the needs of Damascus would require the installation of an additional set of 5,000 KW in the Hameh steam plant and the laying of a transmission line to the Yarmuk plant. This would cost about £S 15 million and would be the most expensive of the three choices. Of the remaining alternatives, the mission considers construction of hydroelectric plants preferable, since the need is for peak power rather than a large and steady output. Elsewhere the mission has recommended construction of reservoirs for irrigation purposes at Deir Makaren and Hameh, and it recommends that hydroelectric plants with a capacity of 10,000 KW be located at these two points, thus harnessing the power which can be developed on the Barada by construction of the two dams.

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These plants would supplement the Souk Wadi Barada project. They should cost only about £S 6 million.

Aleppo

Aleppo's consumption has grown far more speedily than that of Damascus. It is estimated that by 1960 the peak load in the Aleppo area will be about 32,175 KW, requiring an installed capacity of about 42,900 KVA.

The present installed capacity of 15,000 KVA is 27,900 KVA short of the 1960 target. Since construction of the Youssef Pasha hydroelectric plant will start as soon as funds become available, making it inadvisable to overequip Aleppo with thermal plants, no provision was made for a reserve.

The mission recommends the installation in the new steam plant not only of the first stage of 12,500 KVA, but of a second stage of 12,500 KVA and eventually a third stage of 6,250 KVA. The total cost of the second and third stages would be around £S 9 million. Some difficulties might arise toward 1960 but conditions should not be worse than at present. If consumption develops in the manner anticipated, profits from the steam plant will be large enough to give the Youssef Pasha project an earlier start.

We have considered the proposal that the additional thermal plant be located at Homs rather than Aleppo and that a transmission line be built to link such a plant with Aleppo. It has been argued that a plant at this location would provide standby and "peaking" capacity for both Aleppo and Damascus when Syria's hydroelectric resources, including those at Youssef Pasha, are developed and a national grid can be constructed. In addition, fuel oil at Homs would be cheaper and a more plentiful and cheaper supply of water would be available. While the arguments in favor of Homs appear persuasive, we have nevertheless recommended that the plant be built at Aleppo. It would be rather risky to erect a power station at a distance of 190 kilometers from the city it is designed to serve. Moreover, the losses in transmission plus the annual charges on the transmission line, which is likely to require an investment of £S 7 million, will probably offset the economies in operating costs resulting from the establishment of the plant at Homs.

Homs-Hama and the Ghab

The Homs-Hama area is important as the nucleus of a future inter-

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371 connecting network which would extend over a large part of Syria. In
377 particular, it is expected that construction of the Ghab irrigation project will soon lead to increased activity in the area of Hama.

In the general area of Homs-Hama and the Ghab, several hydroelectric plants are proposed by the government, but none is scheduled to be begun before 1960. Even the dismantling of Amir Ghajar, which would be flooded by the Rastane dam, and its relocation at the foot of Rastane, is not scheduled to start before 1962. Most of these hydroelectric plants could operate only when water is not needed for irrigation and would therefore need to be supplemented by thermal plants of equal capacity. This is also true of the Roudj hydro plant and the Rastane siphon and hydro plant. Such projects are economical only when they can be connected with a well-developed grid system. The Homs Lake hydroelectric plant would at least have the eight cubic meters per second available to the Rastane plant even in the dry season, but the head is very low and the amount of power generated is therefore not very significant. Moreover, the mission's proposal for the Ghab area would lead to an increase of power for the Homs-Hama area. Accordingly, these projects have not been included in the mission's program.

With respect to the Ghab, the mission has the following comments. The area of Jisr ech Choghour, because of its location at the outlet of the Ghab valley and on the main road from Latakia to the interior of Syria, will probably develop rapidly during the next few years. During the construction of the Ghab project it will be a supply center and a suitable site for repair shops and material storage for the contractors. This development would be facilitated if Jisr ech Choghour were provided with adequate power and the ability to transmit part of it along the Ghab valley to supply the villages and construction contractors. This would entail the installation in Jisr ech Choghour of an adequate power plant and a transmission line along the Ghab valley to Hama, where it would connect with the Homs-Hama transmission network. Further, because of the length of the interconnection, it would be necessary to build in Hama a second power plant of about the same capacity to ensure stability. The construction of the hydroelectric plant of Jisr ech Choghour was postponed for the reason that it would have been unable to provide enough firm power. The mission recommends that diesel plants with a capacity of about 2,000 KVA each be built in Jisr ech Choghour and Hama and that a transmission line be run between these plants via Karkour, Kalaat el Moudiq, Acharneh and

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Maharda. Each of the diesel plants would cost about £S 1.5 million and the transmission line would cost £S 3 million.

Latakia

The proposed construction of an improved harbor will accelerate the development of Latakia. To meet resultant increased power demands, the mission supports the immediate construction of a diesel power plant in Latakia with an installed capacity of 2,500 KVA as first stage, at a cost of £S 1.5 million. Elsewhere the mission recommends the construction of a multi-purpose reservoir on the Nahr el Kebir for flood control, power, water supply and irrigation. For these reasons, the construction of the Nahr el Kebir power plant is included in the mission's program with an equipment of 2,500 KVA as first stage, at a cost of £S 5 million. These figures are approximate because the studies of this project have not yet been completed and therefore no accurate data are available.

Deir ez Zor

The growth of Deir ez Zor will follow upon the agricultural development of the lower Euphrates valley. In this town the mission supports the immediate construction of a diesel plant with an installed power of 2,000 KVA at a cost of about £S 1 million for the first stage.

Other Areas

It can be assumed that even at a conservative estimate consumption by the 49 smaller towns and villages which now have electricity will increase at the rate of at least 15% per annum, requiring the generation of about 16 million KWH by 1960. In view of the fact that the peak load already utilizes the full power capacity, additional equipment will be needed to meet the demand.

The mission therefore supports the program for the construction in the small towns and villages of 25 new networks, 10 with an installed power of 285 HP each and 15 with 225 HP, aggregating about 5,500 KVA; total cost would be £S 4.7 million. The mission also recommends the installation of about 2,500 KVA at a cost of approximately £S 1.5 million to carry on the program of improving existing utilities.